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Success in Nationally Scaling a Supply Chain System in Indonesia

The United Nations Development Programme (UNDP) works with the Indonesia Ministry of Health in implementing and scaling an open-source digital health solution for medical logistics and supply chain management. This case study was developed by the UNDP Digital Health for Development Hub in partnership with the Indonesia Country Office to promote exchange of knowledge and South-South collaboration on digital health. The case study provides valuable insights and learnings, serving as a resource to guide other UNDP country teams for working on national digital health initiatives.

Indonesia's digital health journey

Guided by the 2021–2024 Indonesia Digital Roadmap, the Ministry of Communications and Informatics is championing an ambitious, whole-of-government digital transformation initiative that includes four key areas: digital society, digital infrastructure, digital economy and digital administration. The central government's commitment to nationwide digital transformation laid the foundation for digital transformation across sectors, including health.

Building from the Decree of the Minister of Health No. HK.01.07/Menkes/422/2017 concerning the Strategic Plan of the Ministry of Health 2015–2019 and the 2021–2024 Indonesia Digital Roadmap, the Ministry of Health – with the support of UNDP – developed the Blueprint for Digital Health Transformation Strategy 2024.¹ The Blueprint provides a roadmap for health sector stakeholders to direct and guide health sector investments in digitalization over the coming years.² The Blueprint is working across the ecosystem to create a supportive environment for sustained digital health investments through the establishment of a dedicated Digital Transformation Management team, a robust governance structure for coordination, and plans for an enterprise architecture approach to data exchange. The governance structure includes a Digital Transformation Management team consisting of an Operations team, a Technology team, a Product Development team and a Data Management team. In addition, there are eight subworking groups (tribes) including, the Primary Care tribe, the Secondary Care tribe, the Pharmacy Resilience tribe, the Health Resilience tribe, the Health Financing tribe, the Health Human Resources tribe, the Internal Management tribe and the Biotechnology tribe.³

The country's enterprise architecture approach is aimed at addressing challenges with fragmentation and data exchange across over 400 digital health systems developed by central and local governments. With support from partners, the Ministry of Health's Center for Data and Information Technology and the Directorate of Disease Prevention and Control designed the SATUSEHAT interoperability platform to utilize data and exchange standards, establish data security protocols, provide core data services (i.e. national provider registry, national health facility registry, national individual registry), support government business processes, and promote the reuse of data to reduce administrative burden and provide access to high-quality data to deliver care and inform decision-making. In March 2024, the Ministry of Health launched the SATUSEHAT interoperability platform with a demonstration and pilot in Jombang, East Java district.⁴

With the implementation of SATUSEHAT, the Ministry of Health will continue its work to harmonize current and future digital health systems using technical specifications.

To implement the Ministry's goals, UNDP Indonesia planned, implemented and continues to develop the Sistem Monitoring Imunisasi Logistik Secara Elektronik (SMILE) as the national supply chain management system for medical supplies and logistics aligned to WHO recommendations.⁵ Now SMILE is being updated to integrate with the SATUSEHAT interoperability platform and has contributed to building the national provider registry and national health facility registry.

The challenge: limited visibility in the supply chain

With more than 270 million people, Indonesia has the fourth largest population in the world and a birth cohort of about 5 million newborns per year distributed over 34 provinces across thousands of islands.⁶ With the size of the population and complex geography, supply chain and cold chain management and distribution are challenging.

In 2018, the Ministry of Health and UNDP Indonesia recognized there was a supply chain challenge: it only had insight into routine immunization data at the provincial level and had no insight at the subdistrict and last-mile levels. The use of non-standard paper-based processes and a lack of visibility across the supply chain meant a lack of real-time visibility of stock levels and temperature, often leading to vaccine wastage, overstocking, stockouts and, subsequently, inadequate vaccine coverage due to a mismatch between supply and demand at the last mile. While reports were being produced at the national level, the data were questioned. This also meant the Ministry was challenged with understanding how the immunization programme was performing across childhood vaccinations and what gaps needed to be addressed in pursuit of zero-dose children (children who fail to receive any routine vaccinations, heightening their risk of death and disease).7

Figure 1. Indonesia's national digital health data architecture



Inspired by work done in India to address similar supply chain challenges and inefficiencies, UNDP Indonesia approached the Ministry of Health's Pharmaceutical Services and Management team to share insights from India's experience. To engage in deeper learning from India's approach, UNDP Indonesia organized a study tour to take both UNDP and Ministry of Health staff to India to explore key questions. Through the study tour, Indonesia learned more about India's planning and implementation approach, challenges, promising approaches and the impact of the chosen system. The study tour also highlighted the expected benefits of a digital solution, such as improved data access, improved timeliness and increased visibility.

> "In anticipation of Indonesia managing such a big data set in coming years with SMILE, a study tour in the last quarter of 2022 was conducted to push the Ministry of Health to move from traditional data-processing application software to invest more in building the large ICT infrastructure of the SMILE platform. We also learned from India on the strategic assistance provided by a helpline for beneficiaries and health workers to register their vaccination schedule and to manage their vaccines and logistics. Now the Ministry of Health has the clearest concept of SMILE ecosystems that is not only about software but also involving hardware and human capacity."

Vidia Darmawi, SMILE Project Manager, UNDP Indonesia

Following the study tour, the Ministry of Health requested UNDP Indonesia to work on digitizing the supply chain data and workflows down to the last mile. To this end, UNDP Indonesia hired technical staff, led stakeholder coordination, mapped workflows, designed standard operating procedures, developed training resources, built the capacity of health workers, and designed and implemented SMILE.

Building the capacity of health workers

To effectively support the project planning and implementation activities, UNDP Indonesia hired additional staff with the necessary technical skills and expertise and undertook a multi-pronged approach to building end-user capacity. Initially, UNDP Indonesia hired 4 staffs were hired to provide leadership, field support and software expertise to the two pilot districts and 54 participating health facilities. Subsequently, during the scale-up of SMILE to 38 provinces, with 514 districts and covering over 10,000 facilities, it was necessary for UNDP Indonesia to expand the project team to 41 staff members, with an infrastructure expert, data analysts, regional staff, provincial staff, help desk resources and other administrative team members. Staff working at the provincial and regional levels have worked tirelessly to execute SMILE, including gaining end-user buy-in and providing the necessary support to health workers. The help desk team provides continuous 24/7 support to all end users, accessed by phone, for troubleshooting issues and identifying and triaging any system irregularities or bugs.

The UNDP Indonesia team also designed change management activities to build the capacity of health workers to adopt SMILE in their daily workflows. The training model included e-learning modules accessible through a mobile application that were developed specifically for end-user training. The e-learning modules are simplified to guide end users in the main system transactions, while the complementary transactions are documented in technical guidelines. These resources can be accessed outside in-person training schedules, supporting on-demand learning. As new features are created in SMILE, the e-learning modules and technical guidelines are updated to reflect the changes and support staff training.

The training model also included 'train-the-trainer' sessions where UNDP Indonesia trained Ministry of Health staff, who then in turn trained provincial and district health office staff on how to use the analytical dashboard in SMILE to monitor the performance of the health facilities (active rate, data quality, vaccine refrigerator temperature monitoring, etc.). The district health offices periodically offer refresher training at health facilities. The UNDP Indonesia team also monitors for health facilities that have not been as actively engaged with SMILE for some time and identifies them for specific follow-up training.

UNDP Indonesia field staff worked hard to support health workers and position themselves as coaches and mentors to end users. They are willing to help fix issues and even mistakes end users make when conducting transactions in SMILE. The field staff team also played a key role in helping to motivate, empower and provide feedback to end users, including female leaders, to build their digital literacy and skills.

> "SMILE makes it easier for us. Easier for procurement, receiving, recording, issuing vaccines. We can do recording and reporting in a timely fashion. The temperature monitoring is really useful for us in our respective cold chain so we can guarantee to the vaccine users that is it is safely stored and appropriate. It is a good system to ensure sound vaccine management."

– Ibu Enalia, Health Worker at the PKC Menteng health facility, DKI Jakarta province The help desk team is the first line of support for SMILE end users. If the provincial and regional officers cannot solve an issue, then the experts and programme officers at the national level will be consulted. The expert and programme staff then decide whether the issue is related to IT and if the SMILE software developer will be involved to work on the technical issue. In addition, the help desk team shares reminders, video tutorials and quick guides for end users on the features in SMILE and how to use them through a WhatsApp group. Staff across all the health facilities in each district are assigned to WhatsApp groups supported by the help desk, representing another way to access real-time assistance.

District health officers have an important supervisory role and have leveraged UNDP Indonesia guidance on how to use the analytical dashboard to evaluate the performance of health facilities during supervision visits. Additionally, internal and external auditors use the SMILE logbook of transactions as their worksheet during audits.

Developing standard operating procedures to support workflows

In 2018, to start planning for a national supply chain system, UNDP Indonesia supported the Ministry of Health in conducting a needs assessment and then worked collaboratively to develop standard operating procedures for supply chain management down to the last mile. This was an iterative process that required engagement and validation with stakeholders to define each step in their business processes, as well as key actors and their roles and responsibilities. Stakeholders were also able to learn from and leverage common business processes and workflows from a similar implementation in India. The standard operating procedures helped to clearly spell out standardized steps, phases and flows, as well as where and how the SMILE system would be used to support certain activities.

Investing time and resources in developing and validating the standard operating procedures was critical to ensure that the technical requirements and use cases were well defined and aligned with end-user needs. The process also presented an opportunity to identify areas where stakeholders could improve efficiencies with a digital solution as it moved to digitize stock data to streamline the distribution process and engage in temperature logging of vaccines to ensure quality and effectiveness. This process led by UNDP Indonesia laid the groundwork for gathering and prioritizing the technical requirements and uses cases, and informed the design of the digital solution that would become SMILE. "We don't want to work twice. It was important that we were firm on the business processes, then designed the requirements and solution around that... We worked hard to standardize the business processes. Had to go back and iterate. Avoids wasting time and money by doing this early and having it tested."

 Augustian Proklamirsyah, IT System and Infrastructure Specialist, UNDP Indonesia

••••• Gaining stakeholder buy-in

Financial support for the SMILE system was provided by Gavi and the Government of Japan, while UNDP Indonesia managed funding, led development and implementation of the SMILE system and collaborated closely with the Ministry of Health and other partners. Governance and coordination activities were managed through technical committees.

When the Ministry of Health first adopted SMILE for the supply chain to monitor routine vaccines, there was still reluctance from the national and provincial levels. There were concerns about changing the way things worked and disrupting processes that would impact performance. It was a slow and intensive process led by UNDP Indonesia to gain buy-in, build trust and demonstrate value to stakeholders. UNDP Indonesia and Ministry of Health team members saw the COVID-19 pandemic as a challenge but also an opportunity. SMILE was not yet scaled across the country for the supply chain, but it was quickly adopted to help monitor COVID-19 vaccines, as it was able to support pressing needs. The use of SMILE for the supply chain soon became widely accepted, as end users were able to collect, track and analyse accurate information on stock levels in real-time to make informed decisions about the supply chain. Users have a heavy workload, and SMILE helps them do their work more efficiently.

To help assess the impact and value of SMILE for stakeholders, UNDP Indonesia conducted an economic analysis of the system and found that it reduced vaccine stock-outs by 70 percent in the first six months after its introduction.⁸ Later, when SMILE was scaled to 25 districts/cities for routine immunization and all 34 provinces for COVID-19 vaccination, a return on investment was calculated at 2.77. This meant that every Rupiah invested in SMILE yielded a return of 2.77 Rupiah along with the initial investment. Further, the analysis found that temperature monitoring could prevent potential losses due to excessive temperature of as much as 457 million Rupiah per month per community health center (Puskesmas), although the report stated that this calculation may possibly lead to an overestimation. The economic analysis highlighted the value of SMILE to stakeholders and helped raise additional funds to continue investing in its use.

"Information on vaccine availability in SMILE can really help us to plan and procure vaccines. Based on stock data from SMILE last year we were able to save budget for vaccine procurement over 100 billion Rupiah."

Staff Member, Directorate of
Pharmaceutical Services and Management,
Ministry of Health, Republic of Indonesia

• Implementing an opensource solution: SMILE

The development of the SMILE system for the supply chain took place in several phases. In 2020, the first phase included hiring a local development team to support development, as well as developing the cloudbased application and back-end database that supported the minimum viable product functionalities of inventory tracking, ordering, asset management, temperature monitoring and profiling. The UNDP Indonesia team piloted the SMILE system across 50 community health centers in Bogor and South Tangerang city for vaccines for routine immunization and gathered feedback on usability, design, functionality and more. Feedback from the pilot tests informed adjustments to the SMILE system, and UNDP Indonesia worked hard to listen to voices from the field and relayed them to the developers to make necessary modifications and adjustments. Overall, end users reported positive experiences with the pilot testing, despite some reluctance among those not yet comfortable with transitioning away from the paper-based processes they had been using for a long time.9

Following the pilot, the initial scale-up of the SMILE system was slow as it rolled out to 25 districts/cities. Later,

the COVID-19 pandemic presented a pressing need to monitor the availability of COVID-19 vaccines down to the local level in real or near real time.

During a second phase of development in early 2021, UNDP Indonesia - at the directive of the Ministry of Health - enhanced the SMILE system with custom features for COVID-19 vaccines and logistics, GPS location, temperature monitoring and tracking, QR code scanning for vaccine vial identification, a website with training materials and customized reporting capabilities, and Application Programming Interface (API) modules to enable interoperability with other systems. The COVID-19 pandemic served as an accelerant, rapidly scaling SMILE and increasing its adoption and use, as Ministry of Health staff and provincial leaders saw immediate value in being able to access supply chain data and conduct reporting and analysis to improve decision-making. The SMILE system was soon used for the COVID-19 vaccine supply chain management system in all 34 provinces across 12,000 Puskesmas and public hospitals (health facilities) used as vaccination sites.

Later, additional phases of development were undertaken to further enhance the SMILE system, meet emerging needs and provide software maintenance. Throughout the development process, UNDP Indonesia worked to ensure the system was designed as an open source solution,¹⁰ whereby code and supporting resources could be shared and reused in other contexts for other uses cases and other programmes. As use of the SMILE system scaled for routine immunizations and COVID-19 vaccinations, government stakeholders became more and more comfortable with the digital solution and began to explore other opportunities to use it.





Adopting SMILE in other programmes

Building on the success of SMILE for routine childhood immunization and COVID-19 vaccination, over time other health programmes in Indonesia adopted SMILE for their needs. SMILE was configured to support health care waste management, logistics management for tracking drugs for tuberculosis (TB), HIV and malaria, and another for rabies vaccine logistics and reporting.

ME-SMILE: UNDP Indonesia supported the Ministry of Health and the Ministry of Environment and Forestry in adapting the SMILE system to monitor and manage medical waste in real time in hospitals. With medical waste being a significant source of pollutants and reaching a volume of 18,460 tons in mid-2021 during the COVID-19 pandemic, the government needed a way to handle medical waste more effectively and safely. The UNDP Indonesia project team assessed needs, developed standard operating procedures, conducted a pilot and launched a new application in 30 hospitals across 4 provinces in 2023. The digital solution, adapted from the original SMILE and called ME-SMILE, includes use of QR-coded waste bags, digital scales, and an application for real-time end-to-end tracking. Since implementation, stakeholders have reported that ME-SMILE reduces the time it takes to process waste (weighing, collection, transportation) from 3 hours to 30 minutes.¹¹

SMILE ATM (AIDS, TB, Malaria): UNDP Indonesia and the Access and Delivery Partnership supported the Ministry of Health in adopting a digital solution to combat HIV, TB and malaria by improving the management of drugs and diagnostic tools. Together the partners adapted the SMILE system and initially piloted it in Southwest Sumba district and East Nusa Tenggara province before implementation. Through SMILE ATM, health workers can now monitor, report on and notify providers about the current situation regarding malaria drugs and logistics in real time. SMILE helps health workers determine stock-outs, enables timely reporting of distribution, and allows quick decision-making to optimize supply chain management.¹²

SMILE for Rabies: The Ministry of Health is currently working to eliminate rabies by 2030 and is engaged in an interministerial effort to adopt a One Health approach to address difficulties in vaccinating stray dogs, cold chain management and vaccine delivery. To help reach this goal and address challenges with a paper-based supply chain management system, UNDP Indonesia expanded the SMILE system for routine immunization to also manage and monitor rabies vaccinations. The team engaged in a planning process, conducted a trial in Bali province and then began to train health workers at all levels in preparation for roll-out. As of July 2024, 353,541 doses of rabies vaccines had been recorded in SMILE.

To date, accomplishments include:¹³



All vaccine inventories digitized at **63,263** cold chain points in Indonesia, linking to 3,883 entities.



Over **5,000** temperature monitors have been installed for remote temperature monitoring of cold chain equipment.



Between 900,000 and

1,200,000 transactions per month on SMILE, showing high levels of usage and adoption by health facility staff.



Data entry errors have been reduced by **95 percent**.



The SMILE system has successfully helped to monitor the distribution of around **454 million doses** of COVID-19 vaccines at over **12,000** health facilities across Indonesia.



The SMILE system is actively used in **38 provinces**, **514 cities** and **11,976 district** Puskesmas and hospitals.



Over **24,000** vaccine handlers and healthcare officers have been trained on the SMILE system.



The SMILE system is used to manage **86 vaccines**.

• Key learnings

Through SMILE, UNDP Indonesia contributed to advancing Indonesia's digital health maturity by strengthening the enabling environment and providing a national system for medical logistics and supply chain management. As a result, stakeholders across the country now have a better picture of the supply chain, leading to less waste and improved decision-making.

The dedicated UNDP Indonesia team worked collaboratively with the Ministry of Health, health workers and other partners to make all instances of SMILE a success. The UNDP Indonesia team played a key role in leading the design and implementation of SMILE and continues to provide support to end users. Through these efforts, the team gained experience and identified promising approaches to implementing a digital solution. Key learnings include the following:

- Promote peer-to-peer learning: As part of the exploratory phase, the UNDP Indonesia team helped the Ministry of Health with learning from other countries and exploring opportunities. A study tour to India enabled staff from the Ministry of Health, UNDP Indonesia and other stakeholders to gain a deeper insight into India's experiences and how they solved similar challenges in their supply chain. This gave stakeholders in Indonesia a sense of what was possible and a clear way to adopt a digital solution.
- Similar Coversion of the source of the sourc
- Start with standard operating procedures: When starting to develop plans for the immunization supply chain, UNDP Indonesia took an important step to assess current supply chain workflows and helped standardize these business processes in preparation for digitization. Through this process, UNDP Indonesia engaged collaboratively with stakeholders and was able to clearly define the needs and requirements around which to design the SMILE system. A deep understanding of workflows and operating procedures is critical when transitioning from paper to digital.

- Adapt open source solutions: In using an open source solution, UNDP Indonesia, the Republic of Indonesia and other stakeholders invested in a solution that is flexible enough to be adapted to other contexts and programmes. This provides an opportunity to configure the core system to meet differing end-user needs at a lower cost and even the ability for SMILE to be adopted in other countries.
- Support end users: The UNDP Indonesia team developed a multi-pronged capacity-building approach that ensured continuous support to health workers through different mechanisms. Efforts included on-demand e-learning modules, in-person training, a WhatsApp group, user guides and help desk support. UNDP Indonesia works tirelessly to support capacity-building and technical support activities to ensure adoption and continued use.
- ✓ Align with the national strategy and architecture: Investments in SMILE, in particular the data collected on providers and health facilities, contributed to the development of the SATUSEHAT interoperability platform. UNDP Indonesia's efforts to help align investments with the national digital health strategy and national digital health architecture to enable exchange and interoperability between all instances of SMILE is a critical and necessary step for helping mature the country's enabling environment.

• Future plans

With the adoption of SMILE for different programmes and use cases, UNDP Indonesia and country stakeholders have had the opportunity to learn from each implementation and gather ideas for future improvements. Plans are currently under way to evolve the core SMILE system into a platform approach that can better facilitate exchange and communication with other digital solutions and reuse common components across programmes. Other planned enhancements include improved e-learning modules, reporting dashboards and visualizations, and support for annual planning. These improvements are intended to make the SMILE system even more scalable.

These learnings provide a roadmap for other countries to learn from Indonesia's experiences and replicate promising approaches to adopting a digital solution in the public health system.

"UNDP works closely with the Indonesian Ministry of Health to harness the full potential of digital technology in the health sector. As part of the Ministry of Health's Blueprint for Digital Health Transformation Strategy 2021–2024, UNDP and MoH co-developed and expanded the SMILE system which has been utilized by more than 12,000 health facilities. This has led to a nation-wide adoption and integration of SMILE into the SATUSEHAT platform that enables the system to play a key role in broader national health data ecosystem. SMILE system has now been replicated and adopted to enhance the efficiency and accuracy of healthcare waste management namely through 'ME-SMILE' across 50 hospitals nationwide. The success of SMILE in building Indonesia's health system resilience will translate into healthier children, empowered women, and more resilient communities."



Norimasa Shimomura, Resident Representative, UNDP Indonesia

¹ Indonesia Ministry of Health, 'Digital Health Transformation Strategy 2024', Ministry of Health, Jakarta, 2024, <u>https://oss2.dto.kemkes.go.id/artikel-web-dto/</u> ENG-Blueprint-for-Digital-Health-Transformation-Strategy-Indonesia%202024.pdf.

- ⁴ Country Health Information Systems and Data Use, 'Indonesia launches interoperability mediator to advance the country's digital transformation', CHISU, 8 March 2024, https://chisuprogram.org/news/indonesia-launches-interoperability-mediator-advance-countrys-digital-transformation.
- ⁵ Digital implementation investment guide: integrating digital interventions into health programmes. Geneva: World Health Organization; 2020. Licence: <u>CC BY-NC-SA 3.0 IGO</u>.
- ⁶ For additional information on SMILE, see <u>https://smile-undp-documentation.readthedocs.io/en/latest/what.html</u>.
- ⁷ Gavi, 'The Zero-Dose Child: Explained', Gavi, 26 April 2021, <u>https://www.gavi.org/vaccineswork/zero-dose-child-explained</u>.
- ⁸ UNDP Indonesia, 'The Economic Analysis of SMILE for Immunization Program', UNDP, 15 February 2024, <u>https://www.undp.org/indonesia/publications/</u> economic-analysis-smile-immunization-program.
- ⁹ For additional information on SMILE, see <u>https://smile-undp-documentation.readthedocs.io/en/latest/what.html</u>.
- ¹⁰ For additional information on digital public goods, see <u>https://digitalpublicgoods.net/standard/</u>.
- ^{II} UNDP Asia and the Pacific, 'Harnessing Innovation: ME-SMILE and South-South Cooperation in Health Care Waste Management', UNDP, 15 June 2023, https://www.undp.org/asia-pacific/blog/harnessing-innovation-me-smile-and-south-south-cooperation-health-care-waste-management-0.
- ¹² UNDP Indonesia, 'UNDP, Ministry of Health's SMILE Application to Help Indonesia's Response to Malaria', UNDP, 26 April 2023, <u>https://www.undp.org/</u> indonesia/blog/undp-ministry-healths-smile-application-help-indonesias-response-malaria#:~:text=The%20SMILE%20Malaria%20application%2C%20a,of%20 malaria%2C%20and%20potentially%20help.
- ¹³ For additional information on SMILE, see <u>https://smile-undp-documentation.readthedocs.io/en/latest/impact.html</u>,

UNDP's work on digital health for development contributes to the Pact for the Future and accelerating progress on the Sustainable Development Goals and the pledge to leave no one in behind. The UNDP Digital Health for Development Hub is a one-stop shop with technical, advisory and partnership support for the introduction and scale up of digital and AI for health as part of its HIV and Health Strategy 2022-25. UNDP is working across 89 countries to identify, adapt and scale up appropriate digital and AI solutions that strengthen health systems and improve health outcomes. The Hub focuses on strengthening policies, capacities and institutions in line with the UN Global Digital Compact and WHO guidance. The Hub also supports knowledge and learning on digital health for development and AI for health across its network of Country Offices, regional hubs and global teams.

Get in touch

If you're interested in knowing more, or to partner with us, please contact us at:

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² Ibid.

³ Ibid.